

Appln No. 10/501,201

Amdt date March 29, 2007

Reply to Office action of December 29, 2007

**Amendments to the Specification:**

Please replace the paragraphs that appear on page 5, line 18 through page 6, line 22 with the following paragraphs.

-- In accordance with one aspect of the present invention, the above and other objects can be accomplished by the provision of an energy recovery driving circuit for driving a load with a certain capacitance, comprising a resonant inductor ~~connected~~ coupled to the load for alternately allowing a charge ~~and/or current or a~~ discharge current to be applied to the load to flow through the resonant inductor; a primary coil of a transformer, ~~connected~~ coupled to the resonant inductor, the primary coil being ~~connected~~ coupled to both the resonant inductor and the load so as to alternately allow the charge ~~and/or current or the~~ discharge current to flow through the primary coil when the ~~charging and/or charge current or the~~ discharge current alternately flows through the load through the resonant inductor; at least one secondary coil of the transformer, ~~connected~~ coupled to the primary coil; and an energy recovery unit for generating a current according to the predetermined number of turns of the secondary coil in the secondary coil to allow the current flowing through the secondary coil to be recovered to a supply voltage source.

Preferably, the energy recovery unit comprises first switching means ~~connected~~ coupled to a supply voltage for receiving a first switching signal to allow a resonance current used to charge the load to flow through the resonant inductor from the supply voltage; and second switching means ~~connected~~ coupled to ground for receiving a second switching signal to allow a resonance current used to discharge the load to flow through the resonant inductor from the load.

Preferably, the energy recovery driving circuit further comprises a sustain driving unit for supplying a sustain voltage to the load; wherein the sustain driving unit comprises third switching means ~~connected~~ coupled between the supply voltage and the load to supply the sustain voltage to the load by reception of a third switching signal after the load is charged by the resonance current used to charge the load, fourth switching means ~~connected~~ coupled between the ground and the load to apply a ground voltage to the load by reception of a fourth switching signal after the load is discharged by the resonance current used to discharge the load, a ~~third~~

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first body diode ~~connected~~ coupled in parallel with the third switching means to prevent a charged voltage of the load from increasing to be greater than the supply voltage when the load is charged, and a ~~fourth~~ second body diode ~~connected~~ coupled in parallel with the fourth switching means to prevent a discharged voltage of the load from decreasing to be less than the ground voltage when the load is discharged. --

Please replace the paragraph that begins on page 12, line 28 with the following paragraph.

-- FIG. 5 is a circuit diagram of a first energy recovery driving circuit according to a first embodiment of the present invention. In the embodiments illustrated in Figs. 5, 6, 7, 8, 9, 10, and 11, an energy recovery unit comprises first switching means (or switch) SW1 connected to a supply voltage for receiving a first switching signal to allow a resonance current used to charge the load to flow through the resonant inductor from the supply voltage; and second switching means (or switch) SW2 connected to ground for receiving a second switching signal to allow a resonance current used to discharge the load to flow through the resonant inductor from the load.

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Please replace the paragraphs that appear on page 9, line 7 through page 12, line 21 with the following paragraphs.

-- In the energy recovery driving circuit according to a first embodiment of the present invention illustrated in Fig. 5, for example, the primary coil is connected between the resonant inductor and the load, the first switching means is connected between the supply voltage and the resonant inductor, and the second switching means is connected between the resonant inductor and the ground; and the energy recovery unit further comprises first and second diodes D1 and D2 for conducting a current in a direction of the supply voltage source. The secondary coil comprises a first secondary coil connected in series with the first diode between the supply voltage and the ground and coupled to the primary coil so as to allow a charge current to flow through the supply voltage source when the charge current flows through the primary coil, and a second secondary coil connected in series with the second diode between the supply voltage and

the ground and coupled to the primary coil so as to allow a discharge current to flow into the supply voltage source when the discharge current flows through the primary coil.

In the energy recovery driving circuit according to a second embodiment of the present invention illustrated in Fig. 6, for example, the primary coil has a first end connected to the resonant inductor and a second end connected to both the first and second switching means, the first switching means is connected between the supply voltage and the primary coil, and the second switching means is connected between the primary coil and the ground; the energy recovery unit further comprises a first diode D1 for conducting a current in an opposite direction of the ground voltage from the ground voltage and a second diode D2 for conducting a current in a direction of the supply voltage; and the secondary coil comprises a first secondary coil connected in series with the first diode between the primary coil and the ground, and coupled to the primary coil so as to allow a charge current to flow out from the ground when the charge current flows through the primary coil, and a second secondary coil connected in series with the second diode between the supply voltage and the primary coil, and the ground voltage and coupled to the primary coil so as to allow a discharge current to flow into the supply voltage source when the discharge current flows through the primary coil.

In the energy recovery driving circuit according to a third embodiment of the present invention illustrated in Fig. 7, for example, the primary coil has a first end connected to the resonant inductor and a second end connected to both the first and second switching means, the first switching means is connected between the supply voltage and the primary coil, and the second switching means is connected between the primary coil and the ground; the energy recovery unit further comprises a first diode D1 for conducting a current in an opposite direction of the ground and a second diode D2 for conducting a current in a direction of the supply voltage; and the secondary coil is provided with a first end connected to the primary coil and a second end connected to a common end of the first and second diodes, and is coupled to the primary coil for allowing a charge current to flow out from the ground when the charge current flows through the primary coil and allowing a discharge current to flow into the supply voltage source when the discharge current flows through the primary coil.

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In the energy recovery driving circuit according to a fourth embodiment of the present invention illustrated in Fig. 8, for example, the primary coil has a first end connected to the resonant inductor and a second end connected to both the first and second switching means, the first switching means is connected between the supply voltage and the primary coil, and the second switching means is connected between the primary coil and the ground; the energy recovery unit further comprises a first diode D1 for conducting a current in an opposite direction of the ground and a second diode D2 for conducting a current in a direction of the supply voltage; and the secondary coil comprises a first secondary coil connected in series with the first diode between a common end of the primary coil and the resonant inductor and the ground, and coupled to the primary coil so as to allow a charge current to flow out from the ground when the charge current flows through the primary coil, and a second secondary coil connected in series with the second diode between the supply voltage and the common end of the primary coil and the resonant inductor, and coupled to the primary coil so as to allow a discharge current to flow into the supply voltage source when the discharge current flows through the primary coil.

In the energy recovery driving circuit according to a fifth embodiment of the present invention illustrated in Fig. 9, for example, the primary coil has a first end connected to the resonant inductor and a second end connected to both the first and second switching means, the first switching means is connected between the supply voltage and the primary coil, and the second switching means is connected between the primary coil and the ground; the energy recovery unit further comprises a first diode D1 for conducting a current in an opposite direction of the ground and a second diode D2 for conducting a current in a direction of the supply voltage; and the secondary coil is connected between a common end of the primary coil and the resonant inductor and a common end of the first and second diodes, and is coupled to the primary coil for allowing a charge current to flow out from the ground when the charge current flows through the primary coil and allowing a discharge current to flow into the supply voltage source when the discharge current flows through the primary coil.

In the energy recovery driving circuit according to a sixth embodiment of the present invention illustrated in Fig. 10, for example, the primary coil has a first end connected to the

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resonant inductor and a second end connected to the load, the first switching means is connected between the supply voltage and the resonant inductor, and the second switching means is connected between the resonant inductor and the ground; the energy recovery unit further comprises a first diode D1 for conducting a current in an opposite direction of the ground and a second diode D2 for conducting a current in a direction of the supply voltage; and the secondary coil comprises a first secondary coil connected in series with the first diode between a common end of the primary coil and the load and the ground, and coupled to the primary coil so as to allow a charge current to flow out from the ground when the charge current flows through the primary coil, and a second secondary coil connected in series with the second diode between the supply voltage and the common end of the primary coil and the load, and coupled to the primary coil so as to allow a discharge current to flow into the supply voltage source when the discharge current flows through the primary coil.

In the energy recovery driving circuit according to a seventh embodiment of the present invention illustrated in Fig. 11, for example, the primary coil has a first end connected to the resonant inductor and a second end connected to the load, the first switching means is connected between the supply voltage and the resonant inductor, and the second switching means is connected between the resonant inductor and the ground; the energy recovery unit further comprises a first diode D1 for conducting a current in an opposite direction of the ground and a second diode D2 for conducting a current in a direction of the supply voltage; and the secondary coil is connected between a common end of the primary coil and the load and a common end of the first and second diodes, and is coupled to the primary coil for allowing a charge current to flow out from the ground when the charge current flows through the primary coil and allowing a discharge current to flow into the supply voltage source when the discharge current flows through the primary coil. --

Please replace the paragraph that begins on page 24, line 3 with the following paragraph.

-- FIG. 20a to 20e are circuit diagrams showing the operation of a two-level energy recovery driving circuit according to an eighth embodiment of the present invention. The two-level energy recovery driving circuit represents an embodiment in which, after energy recovery

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circuits are symmetrically arranged on opposite sides on the basis of a load capacitance C, as shown in FIG. 20a, both the energy recovery circuits are operated at the time of charging/discharging the load capacitance, thus causing charging/discharging. The embodiment of FIG. 20a shows an example in which the energy recovery circuit 100 of FIG. 7 is employed on each of left and right sides of the load capacitance C. As such, the embodiment of Fig. 20a includes a first energy recovery unit including switches SW1, SW2 and diodes D1, D2, and a second energy recovery unit including switches SW3, SW4 and diodes D3, D4. --